Space Weather Technical Forecast

Issued on Wednesday 26 March 2025 at 12:04 Local

This technical forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1/Minor storms likely, chance of G2/Moderate geomagnetic storms days 1 and 2, reducing thereafter.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity reached Moderate levels, due to an isolated M1.0-flare from AR4043 in the northeast at 26/0809 UTC. There are currently four sunspot regions on the Earth-facing disc, all of which are small and magnetically simple. AR4036 has now largely rotated out of view around the northwest limb. AR4043 is now the most significant of the remainder, a small but slowly growing bipolar region in the northeast.

No clear Earth-directed CMEs were observed, though an eruption on the morning on 25th may give a slight chance of a glance on day 4 (29 Mar), though this is low confidence.

Solar Wind / Geomagnetic Activity: Solar wind parameters, as measured by DSCOVR at L1, were indicative of background conditions with a slight recent increase perhaps the early signs of connection to CH25/+. Speeds were generally slow-ambient, around 350-400 km/s, but have increased a little in recent hours 400-430 km/s. Density gradually rose from average to largely above average, peaking at 38ppcc at 26/1049UTC. The Interplanetary Magnetic Field, Bt, was mostly moderate before becoming strong after 25/2355UTC with several recent peaks around 20nT. The north-south component, Bz, was weak and became persistently negative after 25/1515UTC, -4 to -8nT. At around 26/0112 UTC, Bz switched to positive and was weak to moderate in strength, peak +15nT, before then becoming much more variable after 26/0730 UTC and moderate to strong, +16nT to -18nT. The phi angle was negative (towards the sun) until around 26/0112 UTC, when it switched to positive (away from the sun). Geomagnetic activity was at Quiet to Active levels (Kp 2-4), with BGS recording a G1/Minor Storm interval 26/0000-0300 UTC.

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) at GOES18 was at background levels. High energy electron flux (greater than 2 MeV) was at background to moderate levels. The 24-hour fluence was below the Active threshold. The observed integrated pfu was 2.81e6 at 26/0000 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Generally Low activity is expected, with a slight chance of further isolated M-class flares.

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Solar Wind / Geomagnetic Activity: No clear Earth-directed CMEs feature in the forecast, though an eruption on 25th may give a slight chance of a glance on day 4 (29 Mar), although this is low confidence.

Solar winds are expected to rise, gradually increasing to become slightly elevated to elevated day 1 (26 Mar), perhaps becoming strong by day 2 (27 Mar) with the expected arrival of a HSS from the unusually prominent coronal hole feature, CH25/+. The enhanced geomagnetic activity from the HSS is likely to persist into day 3 (28 Mar), before beginning to gradually ease by day 4 (29 Mar).

Unsettled to Active conditions initially will likely become G1/Minor storm (Kp5), with a chance of G2/Moderate storms (Kp6) due to CH HSS influences, peaking day 1 or day 2 (26/27 Mar) before easing later day 3 into day 4 (28/29 Mar), becoming generally Quiet to Unsettled (Kp1-3) by the end of the period.

Energetic Particles / Solar Radiation: High energy proton flux is expected to be at background levels, with a only a very slight chance of enhancement from any larger flares. High energy electron flux is expected to continue at largely background to moderate levels until later in the period, when it may become diurnally high. Electron (1e8 integrated pfu) fluence should remain below the Active threshold throughout the period.

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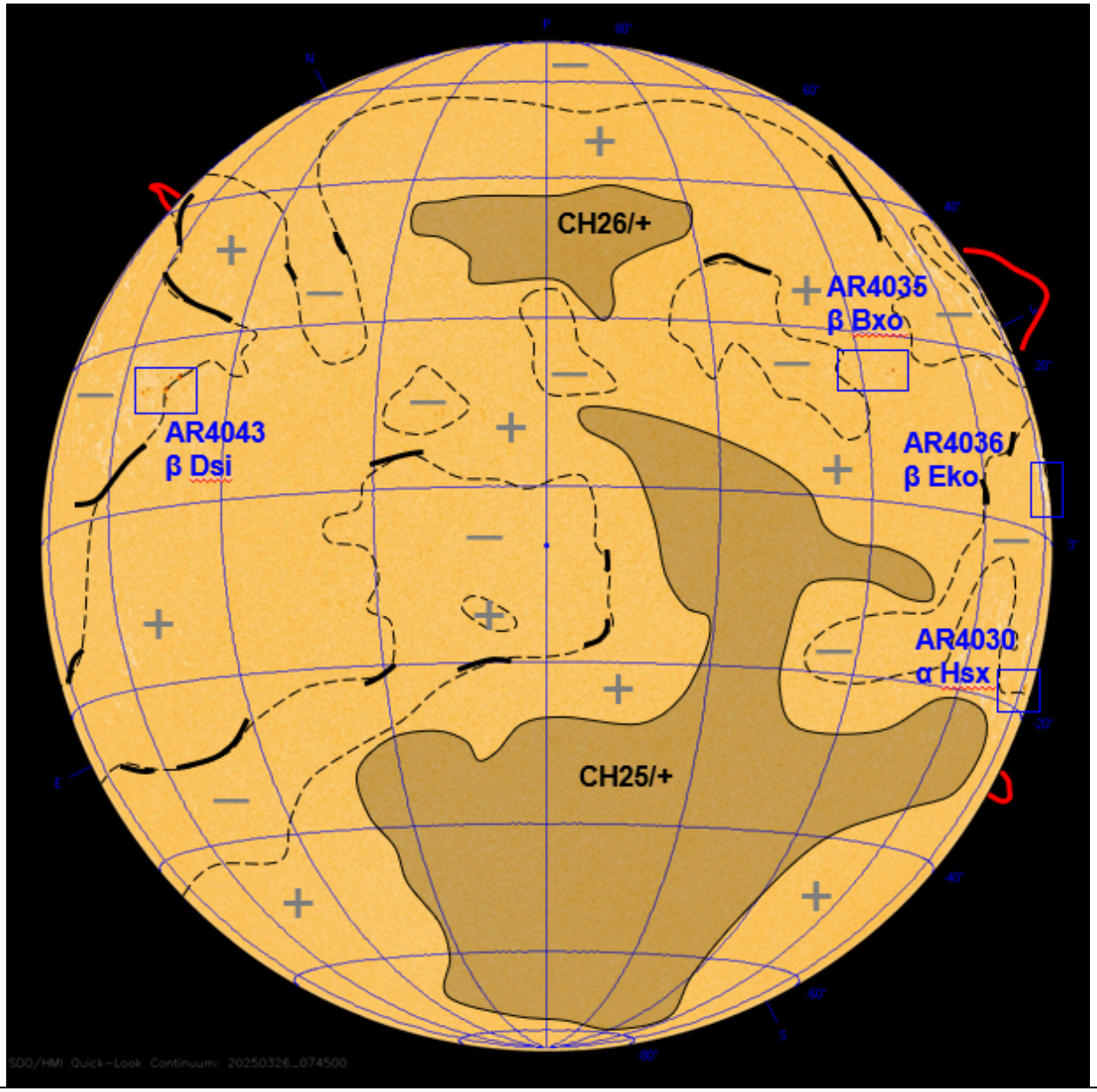
Figure 1: MOSWOC Solar Synoptic Map valid 26/0800UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms

There are no clear Earth-directed CMEs in the forecast at present, though an eruption on 25th may give a slight chance of a glance on day 4 (29 Mar), although this is low confidence.

Solar winds are expected to rise, gradually increasing to become slightly elevated to elevated day 1 (26 Mar), perhaps becoming strong by day 2 (27 Mar) with the expected arrival of a HSS from the unusually prominent coronal hole feature, CH25/+. The enhanced geomagnetic activity from the HSS is likely to persist into day 3 (28 Mar), before beginning to gradually ease by day 4 (29 Mar). During the previous rotation solar winds exceeded 700 km/s for a time. Both the MOSWOC Enlil output and SWPM are likely providing reasonable guidance, with a weighting toward persistence given a similar structure to this coronal hole was observed on last rotation.

Unsettled to Active conditions initially will likely become G1/Minor storm (Kp5), with a chance of G2/Moderate storms (Kp6) due to CH HSS influences, peaking day 1 or day 2 (26/27 Mar) before easing later day 3 into day 4 (28/29 Mar), becoming generally Quiet to Unsettled (Kp1-3) by the end of the period.

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	**G1 to G2**	No	70	60	40	20
Strong	**G3**	No	15	10	1	1
Severe	**G4**	No	1	1	1	1
Extreme	**G5**	No	1	1	1	1

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Figure 2: MOSWOC ENLIL

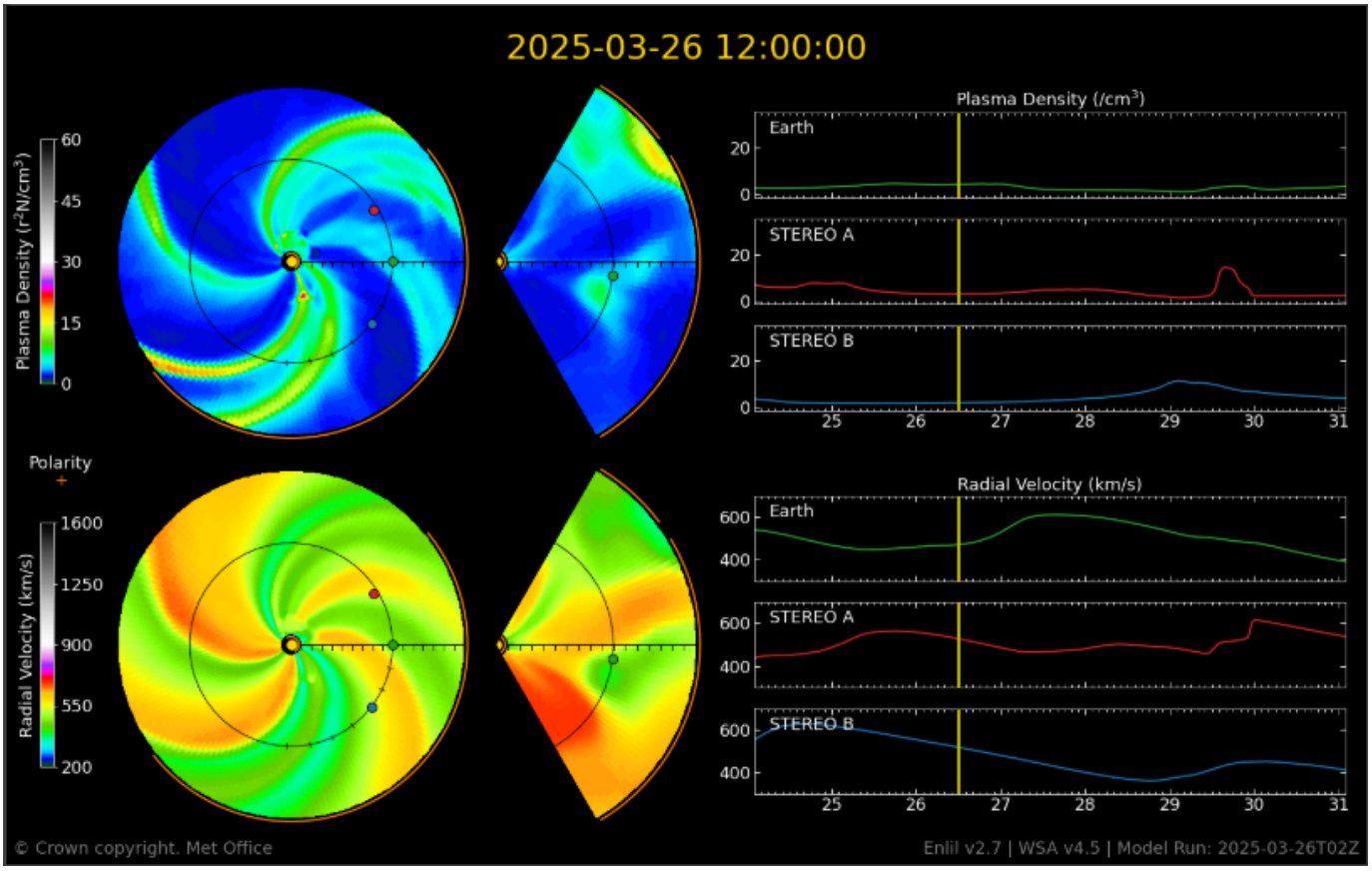
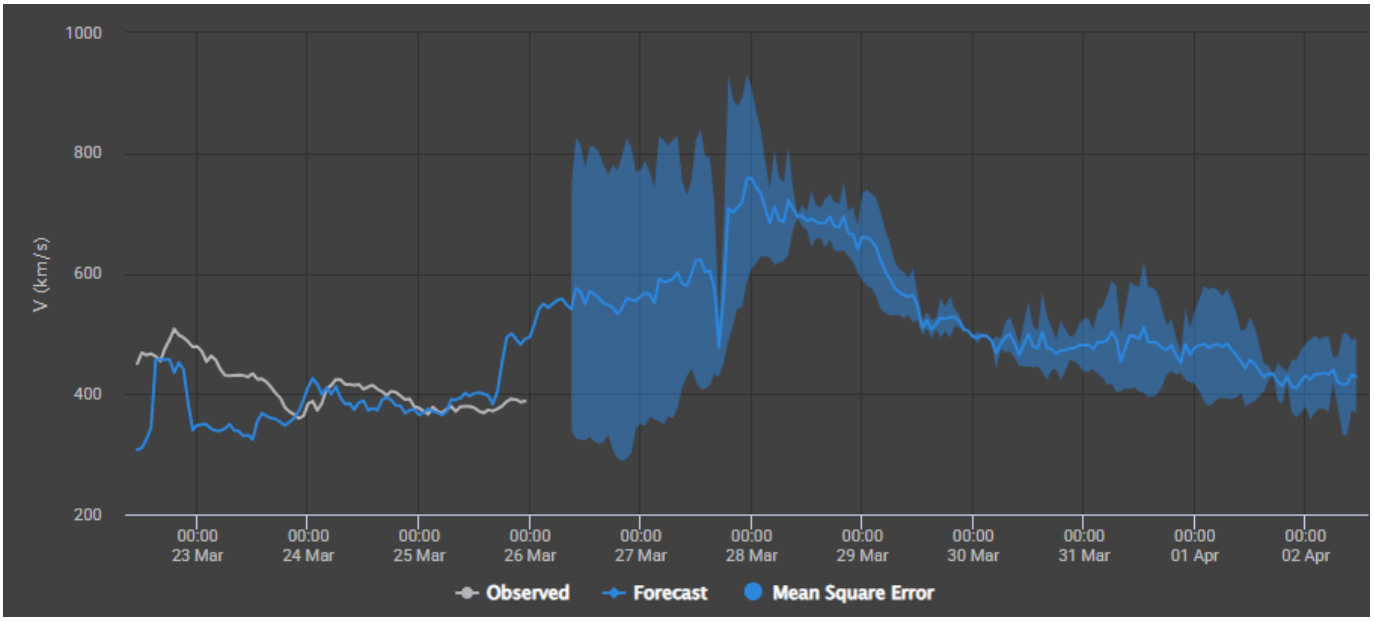


Figure 3: MOSWOC SWPM



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Radio Blackouts - X-Ray Flares

Solar activity reached Moderate levels, due to an isolated M1.0-flare from AR4043 in the northeast at 26/0809 UTC.

There are currently four sunspot regions on the Earth-facing disc, all of which are small and magnetically simple. AR4036 has now largely rotated out of view around the northwest limb. AR4043 is now the most significant of the remainder, a small but slowly growing bipolar region in the northeast.

Generally Low activity is expected, with a slight chance of further isolated M-class flares.

X-Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**R1-R2 (M Class)**	Yes	20	15	15	15
Very Active	**R3-R5 (X Class)**	No	1	1	1	1

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Solar Radiation Storms (High Energy Protons)

GOES18 high energy (>10MeV) proton flux was at background levels. Proton flux is expected to remain at background levels, with only a slight chance of enhancement due to the current lack of large, complex spot groups on the Earth facing disc, and with a reducing trend with time due to AR4036 rotating around the western limb.

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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High Energy Electrons (≥ 2MeV)

GOES16 High energy (>2MeV) Electron flux has been at background to moderate levels. With a chance of enhanced geomagnetic activity due to the HSS from CH25+ at the start of the period, the Van Allen belt is likely to be suppressed away from GEO and electron flux is therefore expected to remain at background to moderate levels. However, as the geomagnetic activity wanes by the end of the period, the charged electron belts may expand back out to the location of GEO, seeing a rise in the electrons later in the period.

Electron (1e8 integrated pfu) fluence should remain below the Active threshold throughout the period. MOSWOC REFM shows the electron fluence should remain below the Active threshold throughout the period, with a rising trend and is considered reasonable guidance with moderate confidence currently.

GEO Electron Environment	Level ($cm^{-2}sr^{-1}$ day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ 1×10^{8}	No	1	5	20	30
Very Active	≥ 2 MeV ≥ 1×10^{9}	No	1	1	1	1

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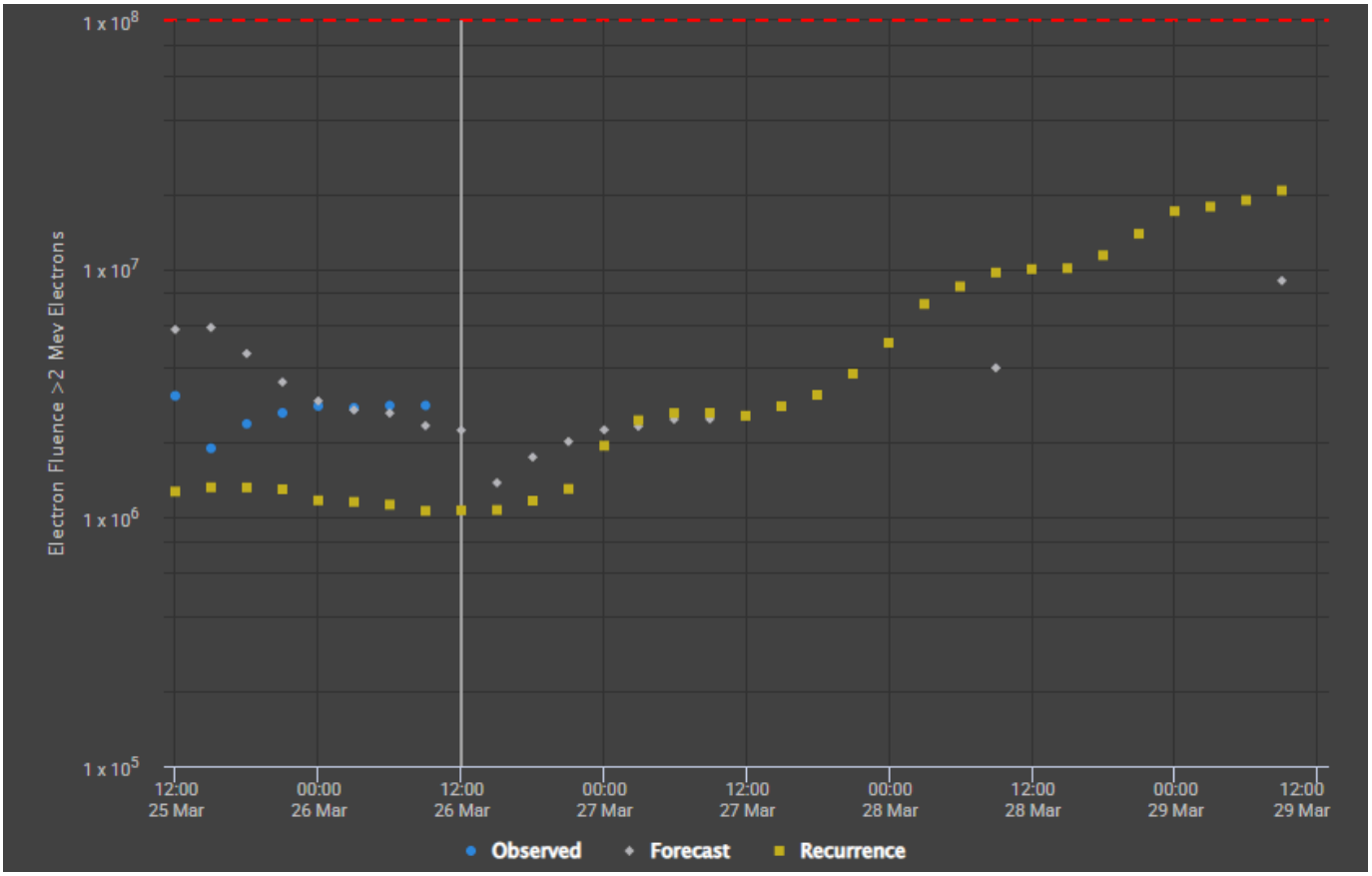
Figure 4: MOSWOC REFM electron fluence forecast/observations/recurrence



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